Paint and Corrosion Protection Guide

Cars
Dear Reader,
This guide covering the topic of "Mercedes-Benz passenger car paint systems – Design, care, damage diagnosis and repair" is intended to provide you with background information about the standard paintwork, paintwork care, damage diagnosis and post-repair refinishing. This guide is aimed at all employees of Mercedes-Benz service operations who deal with the topic of paint either directly or indirectly.

Ideally, every Mercedes-Benz service operation should be in a position to professionally deal with, properly answer and rectify customer questions and complaints about the topic of paint regardless of whether or not it operates its own paint-shop. The contents of this guide are intended to help you significantly in achieving this aim.

As usual, you will find general information about standard paintwork, modifications and new features as well as basic requirements of the vehicle manufacturer with respect to paint damage diagnosis and post-repair refinishing in the Workshop Information System (WIS).

Information about painting materials as well as instructions and processing information from our contracted paint partners are available in the After-Sales Portal in accordance with the approvals issued by Daimler AG.

All of the information relating to technical data in this guide is valid as of the copy deadline in June 2013 and may therefore differ from the current series production configuration and/or the publications in WIS.

Daimler AG
Retail Operation (GSP/OR)

Note
The pictures in this brochure are language-neutral where possible. If this was not possible, German or English texts appear in exceptional cases.

Note
Further information can be found in WIS under DG 98.
General overview

Design and mode of functioning of paintwork and corrosion protection
The human eye first perceives color, followed later by form and function. Naturally, this also applies to the same extent to the paintwork of a vehicle body and its detachable parts.

Alongside the aesthetic requirement for a vehicle to have an individual design in terms of color and color effect, the overall system of vehicle paintwork also has other more extensive functional tasks. These include, above all, protection against mechanical, chemical and biological influences in the vehicle's environment as well as corrosion protection of the vehicle body throughout the entire useful life of the vehicle. The prerequisites for fulfilling these functions are a perfect paint job – both in the series production process and in repair workshops – and proper care of the paintwork structure.

These main topics – the basic design of Mercedes-Benz paintwork and corrosion protection systems, proper paint care, possible types of surface damage as well as damage diagnosis and repair – are covered in this brochure.
Coat structure of vehicle paintwork
The illustration entitled "Schematic illustration of the path of a vehicle body through the painting process" presents the vehicle painting process. As the body passes through the process, the corrosion protection and painting processes described below are carried out.

In the illustration entitled "Schematic structure of a conventional Mercedes-Benz vehicle paint job", the paint coats of a conventional Mercedes-Benz paint job on a body panel are shown e.g. as used on the Mercedes-Benz C, E and S-Class model series.

The overall coat thicknesses applied to vehicles at the plant are as follows:
- On horizontal outside surfaces: 80 µm - 160 µm
- On vertical outside surfaces: 80 µm - 150 µm

The complex requirements which have to be met by vehicle paintwork systems are increasing continuously and include the following criteria, among others:
- Decorative appearance
- Provision of different decorative effects
- Mechanical durability
- Chemical-corrosive durability
- UV resistance
- Temperature resistance both at extremely high and extremely low temperatures
- Repairability in specialist workshops

Look ahead
In future, painting in all Mercedes-Benz production plants and on all model series will be switched over to "Integrated Process 2 (IP2)". The special feature of IP2 is that two coats of base coat are applied "wet on wet". In this process, the first base coat performs the function of a filler/functional layer which means that there is no need for a conventional filler coat.

The omission of the filler/functional layer saves energy and reduces CO₂ emissions while retaining the same high paint quality.

The reduction of emissions of volatile organic compounds (VOC) is not just a major aim for production plants, but also for all paintshops and repair workshops worldwide. For this reason, Mercedes-Benz has set itself the goal of requiring the use of VOC-compliant repair materials in all paint repair workshops worldwide in the medium term and to use them exclusively after a certain transitional period.
General overview

Schematic illustration of the path of a vehicle body through the painting process.
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### General overview

#### A - Conventional structure of a Mercedes-Benz vehicle paint job

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<tr>
<th></th>
<th>Description</th>
<th>Thickness</th>
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<th>Description</th>
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<td>1</td>
<td>Zinc coating</td>
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<td>Zinc coating</td>
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<td>2</td>
<td>Phosphate coating</td>
<td>2 µm</td>
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<td>2 µm</td>
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<tr>
<td>3</td>
<td>Cathodic immersion painting</td>
<td>20 µm</td>
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<td>Cathodic immersion painting</td>
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<tr>
<td>4</td>
<td>Filler/functional layer</td>
<td>30 µm</td>
<td></td>
<td>Water-based base coat 1</td>
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<tr>
<td>5</td>
<td>Water-based base coat</td>
<td>15 µm</td>
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<td>Water-based base coat 2</td>
<td>10 µm</td>
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<td>6</td>
<td>Clearcoat</td>
<td>40 µm</td>
<td></td>
<td>Clearcoat</td>
<td>40 µm</td>
</tr>
</tbody>
</table>

#### B - Structure of a Mercedes-Benz vehicle paint job produced with IP2

Schematic structure of a conventional Mercedes-Benz vehicle paint job
Substrates of body and detachable parts
The design of the substrates (materials and their coatings) of the body and detachable parts forms the basis for corrosion protection and adhesion of the subsequent paint systems.

All Mercedes-Benz model series have been manufactured with fully galvanized sheet metal since 2003. This increases the resilience of the vehicles to corrosion damage as a result of damage to the vehicle paintwork.

The following substrates are currently used for the painted outer skin of Mercedes-Benz vehicles:
- Zinc-dipped steel
- Aluminum
- Plastic
- Composite fiber materials

Special considerations for handling different surface substrates during vehicle repair are covered in the section "Substrates and zoning for post-repair refinishing of the exterior and interior".

Adhesive bonding in body construction
The application of adhesives in body construction has been increasing for years. This increases robustness during production with the aim of greater process reliability. For example, the standard Mercedes-Benz door concept, which is used across the board on all model series, includes full-length bonding of the folds as well as complete adhesive filling of the flanges.
Anti-corrosion systems

Pretreatment (VBH) - Cleaning and phosphate coating
Pretreatment - consisting primarily of the process stages of cleaning and phosphate coating - represents the first process step of the corrosion protection processes carried out during painting.

Aims and properties of pretreatment:
• Cleaning of the outer and inner bodyshell as well as the body cavities to remove deep-drawing aids, lubricants, greases and contaminants resulting from the body construction process
• Aid bonding and ensure resistance to undercut corrosion of entire coat structure in combination with the subsequent cathodic dip painting (KTL)

Cathodic dip painting (KTL)
Aims and properties of cathodic dip painting:
• Uniform coating of outer skin of vehicle body and protection of all body cavities, cut edges and double panel sections
• Main basis for corrosion protection of the entire body
• Adhesion to preceding phosphate coating and basis for all subsequent sealing and coating processes

Seam sealant (NAD)
Aims and properties of seam sealant:
• Sealing of flange edges, double panel sections, seams and edges on the body and on detachable body parts (doors and flaps).
• Adhesion to KTL, ability to paint over, elasticity and stretch, resistance to all mechanical and chemical influences

Underfloor protection (UBS)
The function of underfloor protection and rocker panel coating is performed by underfloor paneling/covers made of plastic on current Mercedes-Benz vehicle models.

Partial underfloor coating with sprayed process materials is only currently used in certain areas of small-run model series (e.g. the SLS and Maybach).

Aims and properties of underfloor protection:
• Protect the vehicle underfloor (and part of rocker panel area) from mechanical damage (mainly stone chipping) and chemical effects (particularly road salt).
Cavity preservation (HRK)
Cavity preservation is mentioned here because this process makes an important contribution to the long-term corrosion protection of the vehicle body. In series production, cavity preservation is carried out after the painting process.

The cavity preservation of Mercedes-Benz vehicles takes place in an automated spraying process with anti-corrosion wax products.

Aims and properties of cavity preservation:
• Sealing of double panel sections, folds, flanges and edges in body cavities
• Water-repellent and impermeable
**Paint systems**

**Filler and functional layer**
Aims and properties of filler and functional layer application:
- Create a level, uniform surface for top coat application
- Aid bonding between the KTL layer and the top coat
- Protect against mechanical (primarily stone chipping) and chemical effects and provide UV protection for KTL

In the Integrated Painting Process 2 (IP2), the first base coat layer performs the function of the filler and functional layer.

**Top coat**
The top coat consists of the base coat and clearcoat. This painting stage is the crucial stage of the process with respect to the color scheme.

For communication with customers, vehicle paintwork is generally divided into standard paints and metallic paints.

**Metallic paints** or metallic-effect paints are paints which have a shiny metallic effect. The effect is produced by the use of pigments which produce a metallic effect. These consist of special metallic flakes (preferably made of aluminium) and mica pigments which are contained in the paint formulation.

**Standard paints** are paints which have no effect-producing pigments.

The top coats applied to the current Mercedes-Benz vehicle model series are environmentally friendly water-based paints.

Aims and properties of top coat:
- Produce a uniform, structure-free and defect-free coloring paint layer
- Provide different effects (e.g. metallic effect paintwork)
- Aid bonding between the filler/functional layer and the clearcoat
Clearcoat
The clearcoat is the last process step in body painting and is thus the uppermost/outer layer of the paintwork structure. Accordingly, the clearcoat is of particular significance with respect to protecting the surface of the overall paint job against mechanical and chemical influences in the environment.

Aims and properties of clearcoat application:
• Protect the top coat from mechanical (scratch resistance) and chemical influences in the environment and provide UV protection (protection against fading/chalking)
• Produce a uniform and structure-free decorative surface
• Adhesion to the base coat

Clearcoat with greater scratch resistance
Clearcoat systems with greater scratch resistance entered series production at the end of 2003, initially on the E/S/CL/SL/SLK-Class model series. Older vehicles equipped with clearcoat with greater scratch resistance are identifiable by the C in front of the color number on the code label (see chapter “Code labels”). Currently, all Mercedes-Benz passenger car model series are equipped with the clearcoat system with greater scratch resistance, which means that there is no need to explicitly mark this on the code label.

Depending on the respective paint supplier, the clearcoats with greater scratch resistance which are used in the individual production plants and on the different model series differ with respect to their chemical composition and their resulting protection mechanisms. However, the protection properties achieved as the end result all meet the uniform high quality requirements of Daimler AG with respect to scratch-resistant clearcoats.

Depending on the paint manufacturer, the special protective properties of clearcoats with greater scratch resistance depend on two different principles:
• Microscopically small ceramic particles known as nanoparticles or
• Chemical cross-linking reaction during the clearcoat drying process.

Irrespective of the composition and their chemical reaction mechanisms, all scratch resistant clearcoats cure in the paint shop drier and form a very dense network structure in the process. This means that the paint is significantly better protected against scratches, such as those caused by mechanical car washing facilities. Even after many years of use, the paintwork has significantly better scratch resistance and greater brilliance than on vehicles where clearcoats with lesser scratch resistance have been used.
Paint work and corrosion protection

Paint systems

Special paints

Special paints achieve their special effect by means of specially developed color pigments or painting processes.

When caring for and repairing these special paints, the relevant specific instructions must be observed in order to maintain their special visual appearance (see sections "Care and preservation of paint", "Paint care products" and "Paint damage repair – Special paints").

The special paints of certain Mercedes-Benz model series are described below.

Alubeam paintwork

Alubeam paintwork produces a surface effect which is reminiscent of liquid metal. This effect is achieved with a new type of extremely thin metallic pigment combined with a specially matched painting process. The high luster of the paintwork requires exceptional cleanliness and care during painting preparation.

Light scattering and reflection by different pigment shapes and arrangements
Matt paintwork (MAGNO/SHAPE)
Vehicles with a matt clearcoat have a heavily reduced luster. The regal-looking matt effect is created by matting agents in the clearcoat. The matting agent in the clearcoat produces an irregular surface which causes, in contrast to shiny clearcoats, the light to be reflected in a diffused manner - resulting in the "matt effect".

MAGNO paints can only be ordered as part of the designo customization range. SHAPE paints are also matt paints which, in contrast to MAGNO paints, are available as standard colors.

BRIGHT triple-coat paintwork
Vehicles with BRIGHT paintwork are characterized by their exceptional color depth. To achieve this effect, an additional varnish-like effect layer is applied between the colored base coat layer and the protective clearcoat.

designo
designo is the customization range for exclusive paintwork and high-quality interior equipment of the AMG Performance Studio. In the area of body painting, designo MAGNO paintwork is available as a combination of metallic paintwork with a satin surface.

Special procedures must be followed when caring for and repairing matt paints. Also see the section "Paintwork care for matt paints".
Basics of paintwork care

The paintwork of a vehicle is exposed to extremely high stresses during the overall service life of a vehicle. In addition to mechanical stresses, e.g. in the form of stone chipping, these primarily include chemical, biological and industrial influences in the environment, UV effects caused by solar radiation as well as the stresses caused by quickly changing and/or extreme outside temperatures.

The visual appearance and durability of vehicle paintwork can be maintained through regular and proper care of the paintwork using approved and recommended paint care products. Alongside regular paintwork care, immediately removing aggressive biological and chemical substances (e.g. bird lime, tree resin, tar etc) helps to maintain the surface quality of the paintwork.

Gloss preserver, paint cleaner and polish
Manual cleaning
The following points must be observed when performing paintwork care manually:

• Preclean the vehicle intensively (e.g. with a high-pressure cleaner) in order to remove coarse dirt from the body and detachable parts.
• Before washing the vehicle manually, spray insect remover on heavily soiled areas and allow it to work according to the instructions for use.
• Use a soft, clean sponge to clean all painted surfaces.
• Use a coarse insect sponge to clean the glass surfaces only.
• Never clean painted surfaces until they are dry; always use enough water.
• Remove all cleaning agent residues with clean water.
• Only use cleaning agents which are specifically intended for vehicle washing. Always observe the instructions for use.
• Never wash painted vehicle surfaces in direct sunlight.
• Wipe the painted surfaces dry with a chamois leather after washing the vehicle. Thoroughly rinse the chamois leather.

Please remember that vehicles should, of course, only be washed in properly equipped areas. Empty containers of cleaning agents and cleaning aids which are no longer required must be disposed of in an environmentally compatible manner in accordance with the instructions of the respective manufacturer.

Washing facilities
Important factors affecting the quality of a washing facility include:

• The technical state of the washing facility
• Clean washing brushes
• Correct contact pressure of washing brushes
• Separate brushes for wheels and entrances
• Good quantity of fresh water
• Soft water
• Sufficient quantity of detergent
• Antibacterial additives in detergent
• Correct washing water temperature (min. 18°C; max. 80°C)
• Correct pH value (between 7 and 11)

Particularly when a vehicle is heavily soiled, the vehicle should be thoroughly precleaned before using a washing facility e.g. using a handheld high-pressure cleaner.
Care and preservation of paint

Major/thorough paintwork care should be performed on the vehicle twice a year. Preferably in the fall and in the spring i.e. before and after winter operation when the vehicle paintwork is exposed to particularly aggressive effects in the form of salt, road grit and other solid contaminants. For vehicles subject to particularly heavy-duty operation, e.g. vehicles used commercially, intensive paintwork care is recommended even more frequently.

Procedure for polishing paintwork

- Thoroughly wash/clean the surfaces to be polished.
- Fully dry the relevant surfaces.
- Apply the paintwork polish sparingly to a polishing wad or microfiber cloth.
- Polish manually using light pressure and circular movements.
- After the polishing process, remove the polish residues with a clean cloth or polishing wad and polish the paint to a bright luster.
- Detachable parts: The same procedure is recommended for all painted detachable body parts.
- Finally, apply a "gloss preserver". This provides greater long-term protection against environmental pollution and ensures a nice appearance of the painted surfaces. The application of preservation agents is carried out in the same way as described for the application of paintwork polish.

Note

In the case of special paints, the special care and repair instructions must always be observed (here: Care and preservation of special paints). If necessary, a specialist Mercedes-Benz workshop operation should be consulted.
Paintwork care of matt paints
Matt paint requires special care in order to maintain the matt surface. Paint cleaners, sanding and polishing products as well as gloss preservers (wax) should never be used on matt paint.

Vehicles with matt paintwork should never be polished. This seriously damages the matt surface by producing gleaming, blotchy patches. **If polishing is performed, the matt effect can only be restored by painting again.**

Excessive rubbing with unsuitable products can also cause brightening. Frequent use of unsuitable or neglected washing facilities can also increase the luster.

Instructions for correct care of matt paints:
- The vehicle should preferably be washed by hand with a soft sponge, neutral soap and plenty of water.
- Avoid washing the vehicle in direct sunlight.
- Immediately remove any adhering insects or bird lime. Soaking in water first is recommended.
- If there are stubborn insect residues on the paintwork, prior spraying with insect remover is recommended.
- If wax inadvertently gets onto the paint surface, remove it immediately with a commercially available silicone remover. In doing so, do not exert excessive pressure on the paint surface.
- Immediately remove resinous, greasy and oily substances as well as fuel from the paint surface using a cloth soaked in commercially available benzine or alcohol. In doing so, proceed carefully and do not exert excessive pressure on the paint surface.
- Remove tar splashes and tar stains with a commercially available tar remover. In doing so, proceed carefully and without excessive pressure.
- Do not apply any adhesive labels, films, magnetic signs or similar items to the paint surfaces because adhesive residues can damage the paint.
- Observe the general instructions for use regarding vehicle care.

Note
Further information about paintwork care of matt paints can be found in WIS DG 98. There you will also find information about the Mercedes-Benz matt paint care set (can be ordered via EPC).
Paint care products

Mercedes-Benz paint care products
We recommend using genuine Mercedes-Benz care products for the optimal care of vehicle paintwork. The Mercedes-Benz care range contains the following cleaning and care products, among others:

- Insect remover
- Tar remover
- Paint cleaner
- Car shampoo
- Fine polishing paste
- Polish
- Gloss preserver
- Paint sealer

These products have been specially tested for material compatibility with Mercedes-Benz vehicles and correspond to the high quality standards of Mercedes-Benz.

The care range also contains the relevant aids required for cleaning and care e.g. polishing wads, microfiber cloths, cleaning and care products for chrome work, light alloy disk wheels and much more.

Note
The entire product range can be found in the EPC under the category "Car paints/operating fluids" in Group 21 "Car care".

Further information about care products for used car detailing can be found in WIS DG 98.

Paint care products of other manufacturers
In addition to the aforementioned Mercedes-Benz paint care products, care products from other manufacturers are available for use in commercial used car detailing. These products have been tested for the used car division of Mercedes-Benz and have been approved for use in this area.

The respective instructions for use and safety information must always be observed when using care products.

Further information about the care products of other manufacturers can be found in the GSP Online Technics Information System (GOTIS) under the Internet address http://gotis.aftersales.mercedes-benz.com.

Note
Please observe the handling information and safety data sheets of the materials. The relevant local/country-specific laws, specifications and rules regarding industrial safety and environmental protection must be observed in accordance with the circumstances of use.
Paint damage

Damaged paintwork can have many different causes. Basically, paint damage can be classified into two groups depending on its cause. On the one hand, damage may be a result of mechanical, chemical and biological influences in the environment and, on the other, paintwork defects may result from series production or workshop activities.

**Paint and surface damage due to environmental influences (in alphabetical order):**
- Fading/color changes
- Tree resins
- Industrial fallout
- Insect secretions
- Lime and cement dust
- Paint scratches
- Acid rain
- Stone chipping
- Tar stains
- Bird lime
- Car wash scratches

**Application-related paint and surface damage (in alphabetical order):**
- Chipping
- Color deviations
- Adhesion defects
- Pops
- Runs
- Edge markings
- Poor covering quality
- Sanding marks
- Dirt and dust inclusions
- Cratering
- Overspray
- Drying-related defects (orange peel)
- Blisters
- Clouding

**Note**
Further information about the diagnosis, causes, avoidance and rectification of paint damage can be found in the After-Sales Paint Portal.

You must register to access this information.
Corrosion

Definition of concept and manifestations
The type of corrosion described here is the electrochemical reaction of a metallic material with oxygen and moisture (water) in its environment. The corrosion process is favored by environmental influences such as moisture, temperature and aggressive media.

When corrosion occurs, the metallic material reacts with its surroundings resulting in a measurable change in the material. These changes can result, on the one hand, in an impaired appearance of the vehicle and, on the other hand, in functional impairments of the vehicle and its components.

Causes and corrosion-promoting factors
- Damage to the paint system down to the substrate e.g. due to stone chipping or mechanical effects
- Aggressive media e.g. in the form of road salt
- High temperatures and rapid temperature changes e.g. condensation formation in a heated garage
- High air humidity
- Aggressive environmental contaminants e.g. industrial fallout or acid rain
- Saline or alkaline washing water e.g. from washing facilities which are not properly maintained
The following procedure must be followed for all assessments and inspections of paint damage:

- Clean/wash the painted vehicle surfaces. Remove coarse soiling. If necessary, use tar/insect remover etc.
- Document the vehicle data.
- Document other damage (e.g. dents, dings etc.) and any aftermarket modifications.
- Measure and document the coat thicknesses.
- If necessary, inspect the paint damage using a reflected-light microscope.
- Document the damage on a paintwork damage sheet.
- Document the damaged areas photographically.

Diagnostic kits with equipment and aids are available to assist with on-site damage diagnosis.

**Process of damage diagnosis**

1. **Customer** → **Complaint** → **Workshop**
   - **Cause of defect/repair method/cost acceptance clear?**
     - Yes → **Diagnosis**
       - Advice, advanced diagnosis, field service
     - No → **Global Service and Parts (GSP)**

2. **Repair possible? Cost acceptance clear?**
   - Yes → **Vehicle handover to customer**
   - No → **Market Performance Center (MPC) or General Distributor (GD)**
     - Technical information
     - Paint information
     - Laboratory test of parts
     - Cost clarification of special parts
     - Support on site
Inspection procedure

Whenever a paint inspection is performed, the ambient conditions must always be taken into account. Ideally, inspections should be carried out at room temperature (approx. 23°C) and at an air humidity of approx. 50%. If the paintwork has been moist/wet for an extended period of time, the paint surface should be given sufficient time to regenerate i.e. the vehicle should ideally be allowed to dry for 24 hours before the paint inspection.

Since this is often not possible in practice, the surface temperatures and humidity values which are actually measured and any information about an extended period of moisture/wetness of the paintwork should be documented together with the inspection results. This is essential to allow an objective assessment of the inspection results obtained.

Minimum requirements of paint damage diagnosis from a technical perspective

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<td>Adhesion defect/peeling paint</td>
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<td>Visual inspection</td>
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<tr>
<td>Coat thickness measurement</td>
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<td>Adhesion test</td>
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<td>Solvent test</td>
<td>x</td>
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<tr>
<td>Polish attempt</td>
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</table>
Coat thickness measurement on metallic surfaces
Test equipment: Coat thickness gauge

Notes:
• Before the measurement, the coat thickness gauge must be calibrated in accordance with the operating instructions.
• The coat thickness gauge must be inspected at defined intervals in accordance with the manufacturer specifications.

Inspection/procedure:
• Place the measuring instrument flat on the surface being measured in accordance with the operating instructions, perform the measuring procedure and document the measurement value.
• Repeat process 3 to 5 times to ensure a correct result. Determine the mean value.

A suitable measuring instrument for non-destructive coat thickness measurement on plastics is not yet available on the market.

Adhesion test
Test equipment: TESA adhesive tape 4122

Inspection/procedure:
• Press the adhesive tape firmly onto the location of the damage (e.g. stone chip damage) and then pull it off upwards suddenly.
• Repeat this procedure 5 times, using a new piece of adhesive tape each time.

Evaluation/result:
No large areas of paint may be lifted up.

Industrial fallout test
Test equipment: Magnet

Inspection/procedure:
• Using the microscopy instruments, loosen deposited particles from the paint surface.
• Place a piece of (blotting) paper and the magnet on the paint surface.
• Lift the paper with the magnet and turn it over.

Result/evaluation:
If the detached particles on the paper follow the magnet when it is moved, metallic wear debris is present.

Acid-base test
This test can be used to check whether surface damage has been caused by an acid or a base.

Test equipment: pH indicator paper, demineralized (VE) water, pipette

Inspection/procedure:
• Drip demineralized water onto the location of the damage using the pipette.
• Place indicator paper on the location of the damage and wait for it to change color - see the instructions of the indicator paper for the expected reaction time.
• Compare the color change of the indicator paper against the supplied scale.

Result/evaluation:
• Acid or base damage may be present depending on the change in color of the indicator paper.
Inspection procedure

Solvent test
There are two small empty glass bottles for the solvent test in the paint damage diagnostic kit. One is for pure benzine and the other is for 2C thinner.

The purpose, procedure and result of the solvent test do not differ depending on whether pure benzine or 2C thinner is used, but 2C thinners have a more aggressive effect on the paint surface than pure benzine.

Do not perform a solvent test in an area which is directly visible to the customer or in direct sunlight.

Purpose:
Check whether:
• Old paintwork has a solvent-sensitive paint layer
• Sufficient compatibility of the repair paintwork with the old paintwork can be ensured

Inspection/procedure:
• Soak a cotton swab in pure benzine or 2C thinner
• Allow the soaked cotton swab to act on the paint surface for 3 min
• Remove the cotton swab and rub surface with a dry swab

Result:
If a paint layer swells up, becomes tacky or detaches completely after the solvent test, there is a solvent-sensitive paint layer on the vehicle.

This solvent-sensitive paint layer should be removed before post-repair refinishing or isolated using EP primer filler. This is the only way to ensure adhesion between the old paintwork and the repair paintwork.

Note
Please observe the handling information and safety data sheets of the materials. The relevant local/country-specific laws, specifications and rules regarding industrial safety and environmental protection must be observed in accordance with the circumstances of use.
Diagnosis kit I must be available for use in every workshop and every repair reception area to carry out the aforementioned test procedures. It contains testing equipment and aids which are required for diagnosing the most common types of paint damage.

Diagnostic kit II is intended for more specific issues relating to paint damage diagnosis. This should be available in every Market Performance Center. Handling the test equipment it contains requires special expertise (paint damage diagnosis training course via Global Training).

### Kit contents

1. Coat thickness gauge
2. Reflected-light microscope
3. Magnifying glass
4. Microscopy instruments
5. Tesa adhesive tape 4122 (19 mm)
6. Magnet
7. Flashlight with retaining clip
8. Universal indicator paper (pH paper)
9. 2 glass bottles 50 ml (no content)
10. Plastic bottle 50 ml (no content)
11. Plastic pipette
12. Sanding paper K 1200
13. Sanding block for abrasive disks
14. Abrasive disks
15. Envelopes (10 units)
16. Magnetic arrow
Paintwork damage sheet
There is a model-specific paintwork damage sheet for the body and detachable components for every Mercedes-Benz vehicle model series.

These damage forms contain information for the purpose of identification and about the damage.

Information for identification:
• Name of customer
• Vehicle ident. no.
• Repair order number
• Main odometer reading
• License plate number
• Name of inspector

Information about damage:
• Description of damage and of suspected cause
• Damage inflicted while driving (e.g.: accident, dents, scratches, stone chips) are to be specified separately
• When was damage noticed?
• State of paintwork
• Required remedial action
• Cost estimate (material and wage costs)
• Comments of Warranty Department

If a coat thickness measurement is required for accurate description of the damage, the results of the measurement can be entered in the paint coat thickness form.

Damaged part texts
The description of the damage type and the damage location is entered in the damaged part texts using damage code numbers. On the damage sheet, the damage location/the damaged component and the damage type (corrosion or paint damage) are recorded unambiguously using these damage codes. The damage can be defined even more precisely with further subordinate damaged part texts (e.g. dust inclusion, run etc.) and a number/quantity can also be specified if applicable.

Note
The paint coat thickness sheet is available in WIS.
Documents for damage description

Damage codes for body parts shown on model 166

Damage codes for detachable parts shown on model 222
Queries on factory finish

When dealing with complex issues, i.e. when the causes of damage are not clearly identifiable, it is often not possible to resolve the issue quickly on-site. The same also applies to the vehicle history e.g. whether it was necessary to repeat a process step during series production. In order to ensure quick and professional processing of cases like this, the workshop must submit an informal query under Group 98 via the TIPS case module, providing the following information:

- Chassis number
- Measured paint coat thickness
- Complaint and indication of affected areas

The workshop must send this query to the respective Market Performance Center (MPC) or the respective General Distributor (GD). The MPC or GD then forwards the query via the TIPS case module to Global Service and Parts (GSP) for research and a response.

**Note**
Further information about queries regarding the factory finished can be found in document SI98.00-P-0014A.
On the current Mercedes-Benz model series, the code labels are installed at the bottom of the B-pillar on the inside. Differing installation locations of other model series are listed in the following table and shown on the illustration "Installation location of code labels".

<table>
<thead>
<tr>
<th>Model series (Class)</th>
<th>Installation location</th>
<th>Model series (Class)</th>
<th>Installation location</th>
</tr>
</thead>
<tbody>
<tr>
<td>163 (M-Class)</td>
<td>2, 3</td>
<td>210 (E-Class)</td>
<td>3, 6</td>
</tr>
<tr>
<td>164 (M-Class)</td>
<td>1, 3</td>
<td>211 (E-Class)</td>
<td>1, 3</td>
</tr>
<tr>
<td>168 (A-Class)</td>
<td>2, 3</td>
<td>215 (CL-Class)</td>
<td>3, 4</td>
</tr>
<tr>
<td>169 (A-Class)</td>
<td>1, 3</td>
<td>219 (CLS-Class)</td>
<td>1, 3, 5</td>
</tr>
<tr>
<td>171 (SLK-Class)</td>
<td>1, 3</td>
<td>220 (S-Class)</td>
<td>1, 3, 5</td>
</tr>
<tr>
<td>202 (C-Class)</td>
<td>6</td>
<td>240 (Maybach)</td>
<td>1, 5</td>
</tr>
<tr>
<td>203 (C-Class)</td>
<td>1, 3</td>
<td>245 (B-Class)</td>
<td>1, 3</td>
</tr>
<tr>
<td>208 (CLK-Class)</td>
<td>2, 3</td>
<td>251 (R-Class)</td>
<td>1, 3</td>
</tr>
<tr>
<td>209 (CLK-Class)</td>
<td>1, 5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Clearcoat with greater scratch resistance (for older model series; omitted on current models)</td>
</tr>
<tr>
<td>H</td>
<td>Water-based paint (older models)</td>
</tr>
<tr>
<td>P, B</td>
<td>Clearcoat with greater scratch resistance (few vehicles, introductory phase)</td>
</tr>
<tr>
<td>K</td>
<td>Paintwork by Karmann (conventional 2-component paint, transition phase)</td>
</tr>
</tbody>
</table>

For Maybach:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO</td>
<td>Color of paint on upper part of body (contrast color)</td>
</tr>
<tr>
<td>LU</td>
<td>Color of paint on lower part of body (basic color)</td>
</tr>
</tbody>
</table>

This paint code may occasionally and incorrectly be present on model plates of other model series.

Maybach vehicles (model 240) are always painted with clearcoat with greater scratch resistance.
Use
Polishing of the paint is used when washing/cleaning and the aforementioned paint care is no longer adequate to achieve a defect-free paint surface. It can also be used if paint defects are present.

Examples of cases where sanding/polishing is used include:
• Small car wash scratches
• Loss of paint gloss
• Small dirt inclusions in paint layer
• Overspray
• Paint runs

The following points should be observed before carrying out the actual polishing process:
• Remove flash rust/industrial fallout, tree resin and insects with the corresponding MB products
• Cover rubber and chrome trim parts
• Pay particular attention to corners and edges (the pressure during polishing is applied to a very small section and can rapidly cause feather-edge sanded areas)

Notes on polishing
• Thoroughly wash/clean the surfaces to be polished
• Then fully dry the affected surfaces
• Pre-polish using light pressure and a low rotational speed
• Then polish at a higher rotational speed
• Move the polishing machine uniformly without high pressure or tilting
• Avoid heating the surface by polishing one area for too long
• Repeat the polishing process if the paint is very dirty/damaged
• After polishing, thoroughly remove polish residues with a microfiber cloth
• Buff with an eccentric polishing machine to avoid ghosting
• Check the polishing result with a daylight lamp

After the polishing process, the polished paint surface should be treated with a paint care product approved/recommended by Mercedes-Benz (see section “Care and preservation of paint”).

To achieve an optimal result, polishing should always be carried out by a trained specialist at a Mercedes-Benz service operation or by a workshop recommended by Mercedes-Benz.

In the case of special paints, the special care and repair instructions must always be observed. Matt paints must never be polished. This seriously damages the matt surface by producing gleaming, blotchy patches. If polishing is performed, the matt effect can only be restored by painting again (also see “Paint care of matt paints” and “Paint damage repair – Special paints”).

Note
Please observe the handling information and safety data sheets of the materials. The relevant local/country-specific laws, specifications and rules regarding industrial safety and environmental protection must be observed in accordance with the circumstances of use.
Post-repair refinishing

General notes
The following information must always be observed when preparing for and carrying out post-repair refinishing:
• Thoroughly clean and pretreat the vehicle/substrate.
• The surface being refinished must be free from all contamination.
• Before performing a partial paint job, all of the detachable parts within the painting area must be removed or fully covered (e.g. vehicle headlamps).
• Adjacent parts/surfaces must be carefully masked off.
• Technical processing information (e.g. mixing ratios, coat thicknesses, flash-off and drying times etc...)

Detachable parts within the paint repair area (locking systems, sensors etc.) should always be removed if possible. Afterwards, they should be cleaned, blown out with compressed air and thoroughly dried so that when they are subsequently reinstalled on the painted component, no paint damage is caused e.g. by water bubbles etc.

PARKTRONIC/DISTRONIC sensors
When applying filler to or painting bumpers, ensure that the maximum coat thickness is not exceeded in the area of the sensors. This can cause malfunctions because the sensors interpret the large coat thickness as an obstacle. The limit for the coat thickness in the area of the sensors is approx. 160 µm.

When drying painted sensors using drying lamps, make sure that an object temperature of 60°C is not exceeded.

Note
Further information about post-repair refinishing can be found in WIS DG 98.
The illustration "Substrates on body exterior of Mercedes-Benz vehicles" illustrates the possibility that different substrates may be present on the outer skin of the body.

The particular repair instructions for the affected vehicles and for the respective body substrates must be observed very closely in these cases.

When performing workshop repair operations, care must be taken to ensure that parts made of steel and aluminium do not come into contact with each other. This applies, in particular, to grinding dust, shavings and sparks from one metal in combination with the other.

All of the tools and aids used by repair workshops must be used either for sheet steel substrates or for aluminium exclusively. The tools and aids must be labeled accordingly and must be stored strictly separated from each other.

If these work instructions are not followed, contact corrosion may occur on the repaired component due to contamination by metallic dust.
Zoning

In series production, the body and its paintwork are divided into directly and indirectly visible areas for the purpose of visual assessment. Accordingly, the painted body is divided into 3 zones with different assessment criteria. This zoning also applies to post-repair refinishing.

Exterior zoning
Zone 1: Defect-free, clean paint surface. Small isolated dirt inclusions are permitted as long as they are over 40 cm apart, provided that the overall appearance is not affected.

Zone 2: Small paint defects, slightly irregular areas, barely visible sanding spots and small dirt inclusions can be left provided that the overall appearance is not affected.

Zone 3: Aside from the deviations permissible for zones 1 and 2, surface irregularities resulting from the bodyshell are permissible here provided that the overall appearance is not affected.

Interior zoning
Zone 1: Not relevant to interior

Zone 2: Includes entrances and door folds

Zone 3: Applies to all other interior surfaces e.g. inside of engine hood, engine hood fold, engine compartment, radiator crossmember, inside trunk lid, trunk lid fold, trunk, fender flanges

Zoning of outer skin shown on model 222
Due to new developments in standard paintwork, repair materials/methods and application techniques, there is a wide variety of possible vehicle repair types - depending on the scope of damage.

The following repair scopes are defined for Mercedes-Benz vehicles:

- Complete paint job
- Partial paint job

Complete paint job
A complete paint job is carried out whenever the scope of the damage means that a partial paint job is not possible (see below), is not cost-efficient or when a complete paint job is necessary due to special circumstances (e.g. special paints).

Partial paint job
A partial paint job is carried out when the damage profile cannot be rectified using the procedure described under the chapter "Polishing".

Single-coat paintwork (for vehicles up to 1992)
Partial paint jobs (paint surfaces demarcated by panel edges, beads or trim strips) are no longer a problem today due to new paint repair materials and techniques.

Variations in the luster of adjacent surfaces can be evened out by polishing the old paintwork.

Twin-coat paintwork
Several methods are available for a partial paint job on two-coat paintwork that can be applied depending on the damage case (scope of damage, affected part, condition and age of the vehicle, color). We recommend advising the customer on the advantages and disadvantages of the different repair methods.

In any case, a sample panel should be produced before post-repair refinishing in order to ensure that the color of the repaired part matches the standard paintwork. Nevertheless, it is not always possible to achieve a complete color match during post-repair refinishing. Color deviations are more likely on metallic paintwork due to their special pigments and application methods.

Note
The respective advantages and disadvantages of the individual methods must be pointed out to the customer before starting a repair.

Only materials approved and tested by Daimler may be used for paint repairs.

The instructions and recommendations of the respective paint manufacturer must be observed.
Methods of paint repair

"Edge-to-edge" painting
Base coat and clearcoat are applied to the entire repair part.

Advantages:
• Cost-efficient repair
• Long-term quality of part is ensured

Disadvantage:
• Color deviations (critical colors) possible to adjacent components

Matting and differences in gloss of the clearcoat compared with adjacent components can generally be rectified with polishing.

Effect matching on part (touch-up job on surface)
The base coat is applied to the area of damage on the repair part and extends out onto the component. Clearcoat is then applied to the entire repair part.

Advantages:
• Cost-efficient repair
• Long-term quality of part is ensured
• Color deviations not likely

This method should be used preferably (if possible).
Effect matching to adjacent parts
The base coat is applied either to the entire repair part or the entire repair part including extension onto adjacent parts (if possible in a V shape).

In both cases, clearcoat is applied both to the repair part and adjacent components.

Advantages:
- Long-term quality of part is ensured
- Color deviation not likely

This repair method provides the best result with respect to visual appearance/color matching.

Spot repair/touch-up
Base coat and clearcoat are applied to the point of damage and extending out from it. The touch-up zone can be polished after drying if necessary.

Advantage:
- Cost-efficient repair

Disadvantage:
- Long-term quality not ensured, there is a risk of visible edges occurring (e.g. through polishing)

Prerequisites:
- The location of damage is in the permitted repair area (see illustration)
- The damaged area has a maximum size of 3 cm
- Repair can be carried out on installed component.
- The area of spot repair painting should not exceed a total size of 20 cm.
- No reduced-gloss paintwork (MAGNO/SHAPE)
Special paints

**MAGNO/SHAPE matt paints**
Together with the Mercedes-Benz paint partners, repair solutions have been developed for all matt paint systems. The repair process corresponds to that of conventional painting with the exception of the clearcoat system used.

In the event of repair, the luster of the vehicle has to be precisely determined in addition to the (paint) color. For this reason, a sample panel must always be produced with base and matt clearcoat before the repair. It may be the case that multiple sample panels have to be produced until the color and luster match that of the vehicle.

When producing the sample panel, make sure that all of the application parameters used are the same as those used later during painting. Different application parameters during production of the sample panel and subsequent painting can have a negative effect on matching of the color, luster, paint distribution etc.

If an "edge-to-edge" paint repair is not adequate on a vehicle with matt paint, a large-surface repair of the entire damaged vehicle side will be effective.

When performing post-repair refinishing with matt paints, attention must be paid to ensure absolute cleanliness because dirt inclusions and paint defects cannot be removed by polishing as on unconventional systems.

**Alubeam**
Minor paintwork defects and soiling should always first be processed by means of sanding and polishing. A paint repair should only be carried out if this repair attempt is not successful.

Since repairing alubeam paintwork requires a high level of craftsmanship, we recommend taking part in an expert training course offered by a Mercedes-Benz paint partner.

Due to the extremely smooth surface of alubeam paintwork, repairs must be carried out with extreme care because substrate defects are clearly visible here.

All Mercedes-Benz paint partners offer approved repair solutions for alubeam.

**Note**
Different specifications must be observed when repairing special paints such as matt paint and alubeam paint. BRIGHT paint systems differ from conventional paint systems only in the form of a second base coat application.

Training videos are available on the topic of "Paint damage repair of special paints" on SDmedia.
To a customer, their Mercedes-Benz workshop is also their paint shop because customers will always contact their Mercedes-Benz partner workshop first in the event of paint damage. The workshop can draw on the expertise of special paint experts from the Daimler organization in the event of complicated cases of damage.

The Mercedes-Benz After-Sales Organization is supplied with paint repair systems by long-standing partners from the vehicle paint industry. The paint systems supplied by the paint partners have been tested and approved in accordance with Mercedes-Benz quality standards and are recommended for use by Mercedes-Benz workshops. The paint partners provide a high level of support to the Mercedes-Benz After-Sales Organization in the form of product support, advice, problem solving and materials/user training etc.

Please contact your relevant Market Performance Center or the After-Sales Portal for information about the paint partners and product lines approved for your respective market.

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**Note**

On the Mercedes-Benz After-Sales Portal under "Paint technology", further information is available on the following topics, among others:

- Information about after-sales paint technology
- Mercedes-Benz repair guidelines for individual paint brands
- Damage diagnosis
- Work safety and environmental protection
- User and materials training

All paint partners also run hotlines for questions about products and paint formulas.

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**Note**

Please observe the handling information and safety data sheets of the materials. The relevant local/country-specific laws, specifications and rules regarding industrial safety and environmental protection must be observed in accordance with the circumstances of use.
After-Sales Portal
http://aftersales.mercedes-benz.com

alubeam paintwork
For general information, see WIS DG 98

Filler/functional layer
For general information on fillers/functional layers, see WIS DG 98

GOTIS (GSP Online Technics Information System)
http://gotis.aftersales.mercedes-benz.com

Cathodic dip painting (KTL)
For general information on KTL, see WIS DG 98

Scratch resistant clearcoat
For further information on scratch resistant clearcoat, see WIS DG 98

Dummy wheels for painting
For information on the use of dummy wheels for painting, see AH 40.10-P-1030-01A

Paint partners
For repair guidelines and product information about the respective paint brands of the paint manufacturers who collaborate with Daimler AG, see the intranet: After-Sales Paint Portal

Paint damage diagnosis
Brochures about paint damage diagnosis are produced by all of our paint partners. They contain information about the cause and avoidance of paintwork defects as well as tips for rectifying them, see intranet, After-Sales Paint Portal

Paintwork damage sheets
For vehicle model-specific paintwork damage sheets, see WIS DG 98

Matt paintwork (MAGNO/SHAPE)
For general information, see WIS DG 98

Phosphate coating
For general information, see WIS DG 98

Mercedes-Benz polish and care products
In EPC under category "Car paints/operating fluids, Group 21 'Car care'

Polish and care products of other manufacturers
Refer to GOTIS for product range

Training
Training courses on the topic of "Paint and damage diagnosis" are offered by Global Training in collaboration with our paint partners.
For the range of training courses, see:
http://gt.mercedes-benz.com
**Abbreviations**

**FS**
Functional layer

**GSP**
Global Service and Parts

**GV**
General Distributor (GD)

**HRK**
Cavity preservation

**IP2**
Integrated process 2

**KTL**
Cathodic immersion painting

**MPC**
Market Performance Center

**NAD**
Seam sealant

**UBS**
Underfloor protection

**VOC**
Volatile Organic Compound

**WIS**
Workshop Information System
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Information and copyright

Product Portfolio
You can also find comprehensive information on our complete product portfolio in our Internet portal:
Link: http://aftersales.mercedes-benz.com

Questions and suggestions
If you have any questions or suggestions concerning this product, please write to us.
Email: customer.support@daimler.com
Phone: +49 (0) 69-95 30 73 76